

compared with one taken in a non-infested district, showed birds to be about three times as abundant in the infested areas during hours of feeding." (p. 17.)

"The failure of birds to check an insect outbreak is evident to all. Their success in preventing insects from becoming abnormally abundant is not so apparent but is no less real. All obtainable evidence, however, points to the fact that the regulative influence exerted by birds when insects are to be found in normal numbers, although less apparent, is none the less important, for at such times artificial control measures are seldom used." (p. 19.)

It is upon the comparative value of artificial control and the activities of natural enemies that the reviewer would make a few remarks. There is a deep-seated, and persistent (because founded on love of ease) idea that if natural enemies are only sufficiently encouraged and protected, crop production free from the annoyance of insect pests will be assured. That this is a dream impossible of fulfillment, is evident from the fundamental interrelations of living things. Natural enemies have developed because there was an excess of individuals of certain species that could be destroyed without any permanent decrease in the numbers of the species as a whole. In creatures with annual or shorter generations as is the case with most insects, all but an exceedingly small proportion of the offspring must die without participating in reproduction; the way of their taking off is unimportant, they may as well be eaten, as to starve, dry up or freeze. Whatever happens to the supernumeraries, a small but fecund minority remains, and the average number of the species is about the same from year to year. If there is an excess of individuals, under natural conditions, that satisfies the demands of enemies, without endangering the existence of the species, what an overwhelming excess of a species there must be where we give over acres or hundreds of acres to pure cultures of its favorite food plants. No wonder there are constantly recurring outbreaks with which natural enemies are unable to keep pace even in a relative way.

As the writer has pointed out elsewhere¹ when we consider the degree of insect control necessary to the commercial success of crops, it is evident that man must almost invariably depend upon his own efforts. We must know about natural enemies, give them all due credit, and protect them, but we must beware of exaggerating their services. People are only too easily misled in this direction but the final result of too great faith in natural enemies is disappointment. Let the student of natural economies see therefore that blame for such disappointment cannot justly be laid upon him.—W. L. M.

Some Bird Enemies of Amphipods.—In an interesting paper² covering the general life histories of 4 species of amphipods found about Ithaca,

¹ Yearbook U. S. Dept. Agr., 1911, p. 245.

² Sonderabdruck aus Internat. Rev. d. gesamten Hydrobiologie u. Hydrographie. Biol. Suppl. III, 1911 (1912), 33 pp.

N. Y., Mr. Geo. C. Embody records some original data by J. T. Lloyd and A. A. Allen, relating to the bird enemies of these crustacea. It is stated that amphipods were found in the stomachs of the Virginia rail, sora, red-winged blackbird, swamp sparrow, long-billed marsh wren, spotted sandpiper, and king eider duck. The last named bird contained 72 specimens of *Gammarus fasciatus*. The Biological Survey has identified amphipods in the stomachs of 30 species of birds, including 6 species of shorebirds, and 14 of ducks. Most of the other birds are marsh-frequenters or visitors like those mentioned by Mr. Embody. The list includes: the seaside, sharp-tailed, and song sparrows, catbird, robin, northern butcherbird, common tern, meadowlark, starling and rusty blackbird.

A recent paper¹ by Hartley H. T. Jackson, comments especially on the Shoveller Duck as an enemy of amphipods, and also lists numerous species of fish which prey upon these crustacea.—W. L. M.

Injurious African Birds.—The Fourth Report² of the Wellcome Tropical Research Laboratories contains two articles dealing with damage to grain crops by birds. The first by Harold H. King (p. 98) briefly states the importance of the matter. It is said that in one province, the losses equal one third of the grain harvested, representing a money value of £70,000.

The second article (pp. 157-177) by A. L. Butler is entitled "The finches and weaver birds of the Sudan, being notes on the group containing the birds injurious to grain crops." The author says "the damage seems to be done entirely by the sparrows (*Passer*) and the extremely abundant weaver birds of the genera *Hyphantornis*, *Xanthophilus*, *Quelea*, and, in a smaller degree, *Pyromelana*." (p. 157.) Reichenbach's Weaver (*Hyphantornis taniopterus*)" appears to be the most abundant weaver in the country, and it congregates in flocks which must, literally, often number millions. Few travellers on the White Nile can have failed to notice the immense flights of these birds, which look at a distance like great drifting clouds of smoke, and which pass overhead with a roar of innumerable wings like the rush of a hurricane. This species and *Quelea aethiopica* are the most destructive birds on the White Nile." (p. 175.)

Mr. Butler's paper treats 23 species of finches, 53 of weaver birds, and in a postscript, one lark. The last named damages grain in the unusual way of hovering in the air and picking off single grains, but the birds come in such vast flocks that fully 50 per cent of the grain is sometimes consumed.—W. L. M.

¹ Bull. Wis. Nat. Hist. Soc., Vol. 10, Nos. 1 and 2, June, 1912, pp. 49-60.

² Khartoum, 1911.